Service/News

Starred items (*) available from New Mexico Bureau of Mines & Mineral Resources

New publications

NMBMMR

***Memoir 40**—Conodonts from El Paso Group (Lower Ordovician) of westernmost Texas and southern New Mexico, by J. E. Repetski, 1982, 121 p., 1 table, 8 figs., 28 plates. More than 16,500 conodont elements of the El Paso Group in the southern Franklin Mountains are studied. 145 species ranging in age from early to late Canadian and distributed among 30 genera, of which *Cristodus* is new, are described. $13.00

***Scenic Trip 9**—Albuquerque. Its mountains, valley, water, and volcanoes (3rd edition), by V. C. Kelley, 1982, 106 p. $4.50

***Resource Map 14**—Active mines and processing plants of New Mexico, by M. J. Logsdon, 1982 (revision RM-9). Plate A—Full-color, 8½ x 11 inch map (scale 1:3,500,000) of state's energy and mineral resources. Plate B—Blue-line copy on 1:1,000,000 scale is a continuously updated location map of active mines and processing plants, cross-referenced with 8 directories of specific commodities. Plate A—$ .50 Plate B—$5.80

USGS

Circular 862—The geothermal research program of the U.S. Geological Survey, by W. A. Duffield and Marianne Guffanti, 1982, 15 p., 1 table, 11 figs.

HYDROLOGIC INVESTIGATIONS ATLAS

HA-0658—Dissolved solids and sodium in water from the High Plains aquifer in parts of Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and Wyoming, by N. C. Krothe, J. W. Oliver, and J. B. Weeks, 1982, 2 sheets, scale 1:2,500,000, lat about 31°30′ to about 43°30′, long about 96° to about 106°

MISCELLANEOUS FIELD STUDIES MAPS (MF)

1344-A—Geologic map of the Hells Hole Further Planning Area (RARE II), Greenlee County, Arizona, and Grant County, New Mexico, by J. C. Ratté and D. C. Hedlund, 1981, lat 32°45′ to 33° 15′, long 108°45′ to 109°15′, scale 1:62,500

1375-A—Geologic map of the El Malpais Instant Study Area and adjacent areas, Valencia County, New Mexico, by C. H. Maxwell, 1981, lat 34°37′ 30″ to 35°03′, long 107°45′ to 108°15′, scale 1:62,500

1375-B—Aeromagnetic map of the El Malpais Instant Study Area and adjacent areas, Valencia County, New Mexico, by C. H. Maxwell, 1981 (1982), lat 34°37′30″ to 35°03′, long 107°45′ to 108°15′, scale 1:62,500

1390—Stratigraphic framework and coal correlation of the Upper Cretaceous Fruitland Formation, Bisti-Ah-Shi-Sle-Pah area, San Juan Basin, New Mexico, by R. M. Flores and M. F. Erpenbeck, 1982, sheet 30 by 36 inches

1425-A—Geologic map of Bunk Robinson Peak and Whitmire Canyon roadless areas, Coronado National Forest, New Mexico and Arizona, by P. T. Hayes, 1982, lat 31°20′ to about 31°35′, long about 108°55′ to about 109°05′, scale 1:62,500

1431—Geologic map of the Dorsey Ranch quadrangle, Grant County, New Mexico, by T. L. Finnell, 1982, lat 32°52′30″ to 33°, long 108°22′30″ to 108°30′, scale 1:24,000

1432—Map of erosion potential and sediment sources in the Navajo mine area, San Juan County, New Mexico, by D. L. Weide, 1982, lat 36°22′30″ to 36°37′30″, long 108°22′30″ to 108° 37′30″, scale 1:50,000

1440—Geologic map of the Cañones quadrangle, Rio Arriba County, New Mexico, by Kim Manley, 1982, lat 36°07′30″ to 36°15′, long 106°22′30″ to 106°30′, scale 1:24,000

1450—Geologic map of the Broke Off Mountain quadrangle, Rio Arriba County, New Mexico, by Kim Manley, 1982, lat 36°45′ to 36°52′30″, long 106°07′30″ to 106°15′, scale 1:24,000

1451—Geologic map of the Bighorn Peak quadrangle, Rio Arriba County, New Mexico, and Conejos County, Colorado, by Kim Manley, 1982, lat 36°52′30″ to 37°, long 106°07′30″ to 106° 15′, scale 1:24,000

Other new publications

U.S. BUREAU OF MINES

MLA 78-82—Mineral resources investigation of the Ryan Hill RARE II Further Planning Area, Socorro County, New Mexico, by C. E. Ellis and D. C. Scott, 1982, 10 p., 1 map, scale 1:62,500

MLA 127-82—Mineral investigation of the Wheeler Peak Wilderness, Taos County, New Mexico, by S. Don Brown, 1982, 32 p., 4 tables, 5 figs., 1 over-size plate, scale 1:50,000

U.S. DEPARTMENT OF ENERGY (NATIONAL URANIUM RESOURCE EVALUATION [NURE])

PGJ/F-012(82)—Aztec quadrangle, New Mexico and Colorado, by M. W. Green and others, 1982, contract no. DE-A113-78GJO1686, 79 p., 10 microfiche, 13 over-size sheets

PGJ/F-013(82)—Gallup quadrangle, Arizona and New Mexico, by M. W. Green and others, 1982, contract no. DE-A113-78GJO1686, 73 p., 8 microfiche, 13 over-size sheets

PGJ/F-016(82)—Albuquerque quadrangle, New Mexico, by M. W. Green and others, 1982, contract no. DE-A113-78GJO1686, 91 p., 9 microfiche, 13 over-size sheets

Van Nostrand Reinhold announces new book

MINES AND MINERALS OF THE GREAT AMERICAN RIFT, by *Richard W. Holmes* and *Marrianna B. Kennedy-Streetman,* 1982, 336 p., 110 illustrations, 6⅞ x 10 inches $29.50

Most of the mineral wealth of New Mexico, Colorado, and Mexico is located in the great continental rift that extends from Mexico to Alaska. However, the true nature of the rift valleys has been disguised by gravel and volcanic filling. *Mines and minerals of the great American rift* helps to uncover what has been hidden by providing information previously unavailable in a single source. . . . The wide range of areas examined include: mineralization along rifts and where they occur in geological evolution, topographical expressions, and associated forms of igneous intrusives; landform occurrences and their relation to the rift; extensive volcanism in and along the rift; locations and names of old mines; metals produced from rift ores and early-day smelting techniques; the relationship of the geological environment to rift and mineral deposits, the growth of the mining industry, and the subsequent development of the land; and carbonatites that are primarily rift-related. Vivid color photographs of minerals—some of them from mines that have been closed—along with crystal drawings and maps, help in visualizing many different aspects of minerals and their origins. (*from the press release*)

Open-file reports

NMBMMR

***159**—Geology of northwestern Gallinas Mountains, Socorro County, New Mexico, by G. C. Coffin, 1981, 214 p., 2 maps $45.80

***160**—Geology and coal resources of Alamo Band Navajo Reservation, Socorro County, New Mexico, by J. C. Osburn, 1982, 64 p., 2 maps $6.00

***169**—Geologic map, cross sections, and map units of the Lemitar Mountains, Socorro County, New Mexico, by R. M. Chamberlin, 1982, 3 plates, scale 1:12,000 $4.50

170—Geologic map of Precambrian rocks in the Magdalena and Chupadera Mountains, Socorro County, New Mexico, by S. Kent, 1982, 2 maps (available for inspection only)

***171**—Geology and coal resources of Mesita de Yeso quadrangle, Cibola County, New Mexico, by O. J. Anderson, 1982, 34 p., 3 figs., 1 map $8.30

***173**—Mineral resources investigation of the Ryan Hill Rare II Further Planning Area, Socorro County, New Mexico, by C. E. Ellis and D. C. Scott, U.S. Bureau of Mines, 1982, 11 p., 1 map $2.20

***176**—Geology and uranium potential of the Tejana Mesa-Hubbell Draw area, Catron County, New Mexico, by D. R. Guilinger, 1982, 137 p., 6 tables, 17 figs., 1 pl., 3 appendices $28.90

***177**—Geologic map of the Taylor Creek tin district, Black Range, New Mexico, by T. L. Eggleston, 1982, 1 map $1.50

USGS

81-459—Seismic-refraction data taken in southwest New Mexico and southeast Arizona, by L. H. Jaksha, A. Garcia, and E. E. Tilgner, 1982, 19 p.

82-888—Origin of the Mariano Lake uranium deposit, McKinley County, New Mexico, by N. S. Fishman and R. L. Reynolds, 1982, 56 p.

82-944—Aeromagnetic map of the west face of the Sacramento Mountains, New Mexico, 1982, 1 over-size sheet, scale 1:62,500

82-968—Evaluation of breccia pipes in southeastern New Mexico and their relation to the Waste Isolation Pilot Plant (WIPP) site, *with a section on* Drill-stem tests by J. W. Mercer, by R. P. Snyder and L. M. Gard, Jr., 1982, 78 p., 1 over-size sheet

82-0267—Water-resources investigations of the U.S. Geological Survey in New Mexico, fiscal year 1980, by R. R. White, 1982, 41 p.

82-0358—Hydrologic investigations and data-collection network in strippable coal-resource areas in northwestern New Mexico, by H. R. Hejl, 1982, 36 p.

82-0375—Water-table map of the San Jose well field and vicinity, Albuquerque, New Mexico, spring 1981, by J. D. Hudson, 1982, 3 p., 1 over-size sheet

82-0411—Oil, gas, and helium references index for the Navajo Indian Reservation, Arizona, New Mexico, and Utah, by J. D. Bliss, 1982, 25 p.

82-0412—Uranium references index for the Navajo Indian Reservation, Arizona, New Mexico, and Utah, by J. D. Bliss, 1982, 37 p.

82-0413—Surface and ground-water references index for the Navajo Indian Reservation, Arizona, New Mexico, and Utah, by J. D. Bliss, 1982, 17 p.

82-0421—Geochemical analysis of potash mine seep oils, collapsed breccia pipe oil shows, and selected crude oils, Eddy County, New Mexico, by J. G. Palacas, R. P. Snyder, J. P. Baysinger, and C. N. Threlkeld, 1982, 41 p.

82-0453—Geologic map of the Laughlin Peak area, Colfax County, New Mexico, by M. H. Staatz, 1982, 1 over-size sheet, scale 1:12,000

82-0500—A description of colored gravity maps of the Basin and Range province, southwestern United States, by T. G. Hildenbrand and R. P. Kucks, 1982, 18 p.

82-0539—World's largest giant uranium deposit in New Mexico?, by H. K. Holen and W. I. Finch, 1982, 6 p.

82-0731—Stratigraphic, structural, and tectonic references index for the Navajo Indian Reservation, Arizona, New Mexico, and Utah, by J. D. Bliss, 1982, 49 p.

82-0742—Map showing zones of similar ages of surface faulting and estimated maximum earthquake size in the Basin and Range province and selected adjacent areas, by P. C. Thenhaus and C. M. Wentworth, 1982, 19 p., 1 over-size sheet, scale 1:2,500,000

Reviews

ELSEVIER'S MINERAL AND ROCK TABLE, by *P. Lof,* compiler; available USA and Canada from Elsevier Science Publishing Co., Inc., 52 Vanderbilt Avenue, New York, NY 10017; available 10 copies for $78.75. Single copies available from Amsterdam office only, 40 Dff (approximately $17.00 U.S.).

A picture is worth a thousand words, and Elsevier has managed to present numerous excellent photomicrographs on their 30 x 50 inch petrographic wall chart. 74 rock-forming minerals in both plane polarized light and with crossed nichols are presented on the upper two-thirds of the horizontally formated chart. In addition, photographs of 53 ore minerals in plane polarized reflected light (some with crossed nichols) also are presented. In general the photographs are excellent reproductions of well chosen fields of view. The minerals are arranged by color, birofringence, and cleavage characteristics in a refreshingly simple format of increasing complexity of petrographic characteristics from left to right. Ore minerals are at the far right. Concisely presented petrographic information is presented beside each photo pair. Supporting petrographic information and classification schemes for a wide variety of rock types are presented in the lower one-third of the chart. The utility of this section may be somewhat limited because only one scheme is presented for each rock group and there is often no universally accepted scheme. This section will, however, be appreciated by the nonspecialists who now have at least one classification for almost all rock types at their fingertips.

One serious flaw mars the utility of this chart, which is clearly intended as a ready reference while at the microscope; its large size precludes using it except as a wall chart. Placed on the wall behind the microscope table, the chart is far enough away for the printed material and, especially, the details of the photographs to be unclear. Many users may choose to fold or cut up this chart. The moderate price and excellent photographs should make this an excellent classroom reference.

—*Glenn R. Osburn*
Volcanologist
New Mexico Bureau of Mines
and Mineral Resources
Socorro, NM

OUR MODERN STONE AGE, by *Robert L. Bates* and *Julia A. Jackson,* William Kaufmann, Inc., 95 First Street, Los Altos, CA 94022 $18.95

Everyone in our present society uses nonmetallics, but few are aware of how or how much they are used. Robert L. Bates and Julia A. Jackson in a new book "Our Modern Stone Age" make sure that those interested are able to discover some answers. They state, "Our main purpose . . . is simply to share with you our fascination with these earth-derived materials and their place in our complex society." In this readable, well-illustrated, 136-page report, they convey their curiosity but also our dependence on these lesser known minerals and rocks.

Those of us who know Bob Bates have repeatedly asked him when he was going to revise his 1960 classic "Geology of the Industrial Rocks and Minerals." His answers usually dealt with the economics of putting out a book on such an esoteric subject as nonmetallics. Bob and Julia Jackson have apparently solved the problem by dwelling less on the deposits of these materials and details necessary for textbooks and more on a brief view of the uses, and needs, and the present problems. This approach makes this book far more interesting to the intelligent layman and broadens its appeal.

In ten chapters the authors look carefully into the problem of industrial minerals from their general use in Chapter 1, transportation ("Rocks en Route") in Chapter 2, to problem cases ["Blast it out and Break it up (But not in my Neighborhood)"] in Chapter 9, and the future ("Looking into the 80's") in Chapter 10. The authors also add an interesting epilogue ("The Chief Industrial Rocks and Minerals and their Major Uses") and three appendices, "Further Reading," "Sources of State Publications," and "Where to go and What to See."

I found the book to be very informative. It contains excellent photographs and readily understandable illustrations on some deposits and extraction and production facilities, as well as transportation methods and the finished products. The book does require a basic understanding of chemistry and mineralogy, but not a great deal more than one would have after the beginning courses in college chemistry and earth science. In my opinion, it makes no pre- ☞

USGS

NEW TOPOGRAPHIC MAPS

	yr	lat	long	scale	contour (ft)
*Bennett Mountain	75-81	32°30′	106°22′30″	1:24,000	10 40
*Bitter Creek	75-81	33°7′30″	106°7′30″	1:24,000	10
*Blakemore Well	75-81	33°30′	106°37′30″	1:24,000	5 25
*Bull Gap	75-81	33°30′	106°	1:24,000	20 100
*Capitol Peak	75-81	33°22′30″	106°22′30″	1:24,000	40
*Capitol Peak SE	75-81	33°15′	106°15′	1:24,000	10 50
*Carrizozo West	75-82	33°37′30″	105°52′30″	1:24,000	20
*Cerro de la Campana SE	75-82	33°45′	106°30′	1:24,000	10
*Church Mountain	75-82	33°30′	105°45′	1:24,000	40
*Domingo Peak	75-82	33°	105°45′	1:24,000	40
*Fuller Ranch	75-81	33°22′30″	106°45′	1:24,000	10 50
*Gacho Hill NW	75-81	34°22′30″	105°7′30″	1:24,000	10
*Garden Spring Canyon	74-82	33°45′	106°15′	1:24,000	40
*Golondrina Draw	75-81	33°15′	105°52′30″	1:24,000	40
*Granjean Well	75-81	33°37′30″	106°37′30″	1:24,000	5
*Harriet Ranch	74-81	33°30′	106°45′	1:24,000	10 50
*High Rolls	75-82	32°52′30″	105°45′	1:24,000	40
*Indian Well Wilderness	75-81	33°45′	106°52′30″	1:24,000	20 10
*Little San Pascual Mountain	75-82	33°37′30″	106°45′	1:24,000	5 20
*Lovelace Mesa	74-82	33°52′30″	106°	1:24,000	20
*Luis Lopez	75-82	33°52′30″	106°52′30″	1:24,000	20 10
*Mockingbird Gap	75-82	33°30′	106°22′30″	1:24,000	40
*Mound Springs	75-82	33°22′30″	106°15′	1:24,000	10
*Nogal Peak	75-82	33°22′30″	105°45′	1:24,000	80
*Oscura	75-81	33°22′30″	106°	1:24,000	20
*Oscura Peak	75-82	33°37′30″	106°15′	1:24,000	40
*Pink Peak	74-82	33°45′	106°7′30″	1:24,000	20
*Pope	74-81	33°30′	106°52′30″	1:24,000	10 50
*Prairie Spring	75-82	33°52′30″	106°30′	1:24,000	10
*Sabinata Flat	75-82	33°	105°52′30″	1:24,000	40
*Salinas Peak NW	75-81	33°22′30″	106°37′30″	1:24,000	10 50
*San Antonio	75-81	33°52′30″	106°45′	1:24,000	20 10
*San Marcial	75-82	33°37′30″	106°52′30″	1:24,000	20 10
*Three Rivers NW	75-81	33°22′30″	106°7′30″	1:24,000	10
*Tularosa	75-82	33°	106°	1:24,000	10
*Tularosa Peak	75-81	33°	106°7′30″	1:24,000	10
*Wrye Peak NW	74-82	33°45′	106°22′30″	1:24,000	20

REVISED TOPOGRAPHIC MAPS

	yr	yr (rev)	lat	long	scale	contour (ft)
*Bard	68	79-82	35°7′30″	103°7′30″	1:24,000	10
*Riley Camp	68	79-81	35°	103°7′30″	1:24,000	10
*San Jon	68	79-81	35°	103°15′	1:24,000	10

tense of being a textbook for any level, but is rather an informative book on certain common industrial rocks and minerals. Such a source fills an important niche for both professionals and amateurs, and I highly recommend it for that purpose.

—*George S. Austin*
Deputy Director
New Mexico Bureau of Mines
and Mineral Resources
Socorro, NM

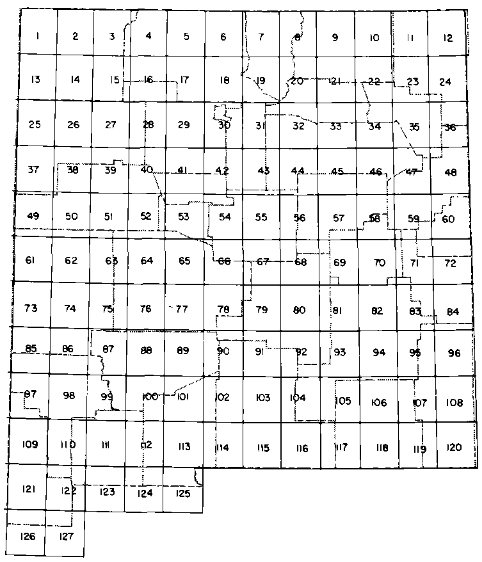
Announcements

USGS OPEN-FILE REPORTS AVAILABLE

The New Mexico Bureau of Mines and Mineral Resources in Socorro, NM, is now a depository for all U.S. Geological Survey open-file reports concerning New Mexico and immediately adjacent areas. The reports are available to anyone for public inspection. Copies will also be available at \$.20 per page and \$1.50 for white prints of maps. These will be copied at Bureau convenience.

STATE LAND OWNERSHIP MAPS AVAILABLE

Alex J. Armijo, Commissioner of Public Lands, in August 1982 authorized the sale of recently completed quadrangle maps of New Mexico reflecting state land ownership. These maps are on a scale of one-half inch per mile. Each quadrangle map covers an area of approximately 29 mi east and west by 35 mi north and south. The maps are priced at \$100 per complete set or at \$1.25 per quadrangle. To order, send numbers wanted and check covering cost to: Commissioner of Public Lands, Attn: Mapping Division, P.O. Box 1148, Santa Fe, NM 87504–1148.



RIO GRANDE RIFT CONSORTIUM

Representatives from the National Science Foundation, NASA, the U.S. Geological Survey, the Department of Energy, and the National Academy of Science as well as researchers from agency contractors and universities met in Santa Fe in March 1982 to discuss methods to improve communication concerning research performed on the Rio Grande rift. The 25 participants formed the Rio Grande Rift Consortium, which is open to regional, state, and federal agencies, their contractors, universities, and industry.

The consortium will provide a focus for rift research, identify research gaps, foster communications, increase visibility of rift research and its scientific merit, and prompt special sessions at national meetings. The consortium also publishes a periodic newsletter. To subscribe to this free newsletter, write Bob Riecker, Los Alamos National Laboratory, P.O. Box 1663, Los Alamos, NM 87545.

Abstracts

THE AGE OF THE FRUITLAND AND KIRTLAND FORMATIONS OF THE SAN JUAN BASIN, NEW MEXICO: A REVIEW OF THE EVIDENCE, by *Adrian Hunt,* New Mexico Bureau of Mines and Mineral Resources, Socorro, NM

The age of the Fruitland and Kirtland formations has been a subject of controversy since their naming in 1916. Recent debate, spurred by magnetostratigraphic studies, has centered on the presence or absence of terminal Cretaceous beds in the Fruitland–Kirtland sequence. Virtually all known vertebrate fossils come from the west-central basin where age constraints on the Fruitland and Kirtland are late, but not latest, Campanian ammonites in the Lewis Shale and Puercan mammals in the lower Nacimiento Formation. Among the dinosaurs the presence of *Kritosaurus, Parasaurolophus, ?Monoclonius,* and *?Chasmosaurus* indicates a Judithian age, whereas, aff. *Torosaurus* and *Alamosaurus* suggest a Lancian age, at least for the Naashoibito Member. The poorly known mammal fauna seems closer to Lancian than Judithian faunas and may be Edmontonian. A sequence of four dated volcanic ashes in Hunter Wash, in the lower Kirtland, indicate a late Campanian to, at least, mid-Maastrichtian age. Magnetostratigraphic investigations in the same area indicate that the Fruitland–Kirtland sequence extends to the end of the Maastrichtian although these results seem to contradict other data. Although pollen studies are self-contradictory, indicating ages from Campanian to late Maastrichtian, most would be consistent with a late Campanian to early Maastrichtian age for the Fruitland–Kirtland. Megafloral, nonmarine invertebrate, and lower vertebrate studies do not give conclusive age determinations. The majority of evidence would indicate a late Campanian to early Maastrichtian (Edmontonian) age for the Fruitland Formation and pre-Naashoibito Member Kirtland Shale. More evidence is required to determine the age of the Naashoibito Member. (This is an abstract of a paper presented at the 35th annual symposium on southwestern geology held at the Museum of Northern Arizona in August 1982.)

GEOLOGY AND GEOCHEMISTRY OF TIN OCCURRENCES IN SOUTHWESTERN NEW MEXICO, by *William T. Georold,* 1981, M.S. thesis, Pennsylvania State University

The Mogollon–Datil volcanic field of southwestern New Mexico is host to the tin-bearing Taylor Creek Rhyolite. The purpose of this investigation was to gain new insights into the physicochemical characteristics of these volcanic-hosted tin deposits and to develop an efficient method of geochemical exploration to detect undiscovered volcanic tin deposits. A combination of panning, heavy liquid, and magnetic separation of stream sediments from three separate drainage areas with tin or tungsten mineralization was conducted. Anomalous concentrations of tin and tungsten were found in drainage areas as large as 200 and 36 mi^2 (520 and 90 km^2), respectively, downstream from the known sources. An application of the orientation study results in a reconnaissance survey covering 6,000 mi^2 (15,500 km^2) of west-central New Mexico that disclosed an area of anomalous tin in streams draining rhyolites of similar petrology to the tin-bearing Taylor Creek Rhyolite. The newly discovered region of anomalous tin is more than 15 mi (24 km) northwest of the present boundary of the Taylor Creek tin district, in the mountains adjacent to the southwest corner of the Plains of San Agustin. Anomalous tungsten concentrations were found near the Magdalena Mountains, Ladron Mountains, and southeast San Mateo Mountains. Detailed mapping of a mineralized rhyolite in the Squaw Creek area of the Taylor Creek tin district in Catron and Sierra Counties established a volcanic stratigraphy of several facies of porphyritic rhyolite overlain by reworked pyroclastic sediments and younger alluvial material. The mapped area was deduced to be on the flank of a volcanic dome partially exposed by erosion. Geologic studies in this area corroborated Fries' (1940) correlation of tin mineralization with altered rhyolite. Reflected and transmitted light microscopy, x-ray diffraction studies of altered and unaltered rhyolite, and oxygen isotopes of quartz and matrix material contributed to a better understanding of the physicochemical conditions of mineralization. Based on these and previous studies, the Squaw Creek mineralization is postulated to have taken place at a maximum temperature of 300°C at very shallow depths. Precipitation of metals from the proposed hot-spring magmatic or enriched meteoric waters could have been caused by any combination of f_{O_2} change, or temperature or pressure drop. Mineralization appears to have been concentrated at the periphery of the volcanic dome. Trace and major elements were studied from Taylor Creek Rhyolite and other rhyolites from anomalous tin-containing stream drainages. Altered Taylor Creek Rhyolite rocks were found to have silica and ferric iron significantly enriched relative to unaltered Taylor Creek Rhyolite. Statistical comparison of Taylor Creek flows and tuffs revealed that the tuffs, overlying the flows, were significantly more mafic than the flows. These tuffs could be the heavier remnants of a single-zoned magma chamber that erupted the upper, more silicic flows followed by the lower, more mafic tuffs. Comparison of Taylor Creek Rhyolite with average granites and tin-bearing granites resulted in the conclusion that both the Taylor Creek and tin-bearing granitic rocks are considerably more differentiated than average granites. However, the tin-bearing granites and Taylor Creek Rhyolite are not chemically identical although both types of the tin-bearing granitoids show characteristics of the metasedimentary-derived S-type granites. Trace and major element values and ratios from rhyolites in drainage basins with anomalous tin in stream sediments indicate ranges that are compatible with other tin-bearing granitic rocks as established by previous literature. Future exploration and study of these areas may turn up previously unknown tin deposits.

UNIVERSITY OF WISCONSIN (MADISON) DOCTORAL AND MASTER'S THESES, SPRING 1982

DEPOSITIONAL HISTORY AND DIAGENESIS OF THE GOAT SEEP DOLOMITE (PERMIAN, GUADALUPIAN), GUADALUPE MOUNTAINS, WEST TEXAS–NEW MEXICO, by *G. Allan Crawford.*

The Goat Seep Dolomite formed the first large, high-angle, reeflike carbonate unit in the Permian Reef complex of west Texas and New Mexico. The unit is pervasively dolomitized and formed at a submerged shelf margin from submarine-cemented, skeletal-lean, fine-grained, clastic carbonate sediment. The Goat Seep outcrops only in the Guadalupe Mountains of west Texas and New Mexico where it was examined for this study. The Goat Seep Dolomite constitutes the lower third of the Guadalupian shelf-margin strata and underlies the world-famous Capitan Limestone. The Goat Seep Dolomite, like the Capitan Limestone, consists largely of submarine-cemented, high-angle strata deposited on a high-relief shelf margin. The dominant preserved organisms in both are sponges. However, the Goat Seep is not simply an older Capitan but differs in significant aspects of morphology, mineralogy, fossils, and cements. Compared to the Capitan, the Goat Seep: 1) has a much thinner to absent shelf edge or "reef" facies, 2) is largely dolomite whereas the Capitan is primarily limestone, 3) contains little or no skeletal boundstone, algae, or the problematic organism *Tubiphytes,* which are common in much of the Capitan (particularly the Upper Capitan), and 4) contains few coarse fibrous cements that are interpreted to have an early marine origin but which are abundant in the Capitan. The Goat Seep can be divided into three major facies: 1) a shelf-edge or reef-like facies that consists largely of poorly bedded skeletal floatstone and minor cement framestone (Embry and Klovan, 1971, classification) deposited on slopes of 25°–30°; 2) a foreslope facies of moderately well bedded skeletal floatstone and minor interbedded sandstone deposited on slopes of 10°–25°; 3) a deeper water (300 m) toe-of-slope facies consisting of channelized debris flow and other gravity-flow deposits composed largely of carbonate sediment derived from the topographically higher shelf, shelf-edge, and foreslope facies. The sediments were deposited on slopes of less than 10° (much on slopes of only a few degrees). The transition from shelf-edge to shelf strata is abrupt, occurring within a vertical distance of a few meters. As in the Capitan shelf strata, the shelf strata adjacent to the youngest Goat Seep appear to dip gently basinward into the Goat Seep suggesting that the Goat Seep was deposited in deeper water than the adjacent shelf strata. The transition from interbedded carbonate and siliciclastic rocks in the toe of slope to the largely siliciclastic basin strata occurs over a lateral distance of several hundred meters. Goat Seep deposition along the present exposures of the west face of the Guadalupe Mountains began as a major basinward sloping surface that resembles the longitudinal profile of a slump scar. This erosional surface, of enigmatic origin, slopes basinward at about 45° in its upper part, truncating nearly 75 m of flat-lying strata of the Getaway Bank and Grayburg Formation. Basinward this surface flattens and probably truncates an additional several tens of meters of strata over a distance of about 1.5 km. The Goat Seep is pervasively dolomitized. Based on petrographic evidence, heavy oxygen isotope values (+1 to +3.3‰ PDB), and Sr trace-element data, the dolomitization is interpreted to have resulted from brine reflux during later Guadalupian and Ochoan (Permian) time and a later fresh water-salt water mixing. Field studies reveal no apparent depositional break where the Capitan overlies the Goat Seep. The Goat Seep–Capitan contact has been mapped during this study at the top of a foreslope sandstone that can be traced shelfward into the Shattuck Sandstone Member of the Queen Formation. This is the only reported shelf sandstone equivalent to either the Goat Seep or the Capitan that has been traced from the shelf into the foreslope. Previously the contact was mapped along the limestone-dolomite transition; however, this transition crosscuts bedding planes rather than paralleling them and is not a correct time correlation with the Goat Seep–Capitan contact originally defined by King (1948) in the foreslope and toe-of-slope strata on the west face of the Guadalupe Mountains. The Shattuck Sandstone at the shelf-slope boundary has a unique forked geometry. The sandstone in the basal part of the Shattuck can be traced off the shelf and down the high-angle foreslope and yet the upper part of the apparently continuous sandstone extends basinward across several tens of meters of high-angle carbonate before it reaches its ultimate pinchout. Finally, the Goat Seep was not an organically bound ecologic reef nor was it an emergent barrier reef. It was a submerged, submarine-cemented, high-angle, skeletal-lean, fine-grained, clastic carbonate mass formed at the high-relief shelf margin of the Delaware Basin. Shelf-to-basin relief was about 350–400 m and minimum water depth over the Goat Seep was probably 10–20 m.

SEDIMENTOLOGY OF THE CUTOFF FORMATION (PERMIAN) WESTERN GUADALUPE MOUNTAINS, WEST TEXAS AND NEW MEXICO, by *Mark T. Harris.*

The Cutoff Formation records a complex history of basin facies deposition and erosion in latest Leonardian and earliest Guadalupian time. It is commonly 60–80 meters thick and is predominantly a fine-grained, dark, slightly argillaceous limestone, locally silty. The Cutoff strata exposed along the north-south-trending western escarpment of the Guadalupe Mountains overlie a 3-km-wide shelf margin that had a depositional relief from shelf to basin of about 300 m. This shelf margin faces the Delaware Basin to the south-southwest and was the site of erosion and deposition during Cutoff time. Due to post-Cutoff, early Guadalupian erosion, the Cutoff strata occur in three discontinuous areas: shelf, shelf margin, and basin. Correlation from one area to another has long been problematical. In this study more certain correlation from shelf to basin was established by the recognition of five correlative units which occur within the Cutoff in an upward vertical succession: 1) black, medium-bedded, laminated to nonlaminated, cherty lime mudstone (generally absent along the shelf margin due to intraformational erosion); 2) dark-gray to brown, very thinly bedded, finely laminated, interbedded lime mudstone and shale; 3) dark-gray, laminated to nonlaminated, medium-bedded lime mudstone in laterally continuous beds; 4) interbedded lime mudstone-shale; and 5) dark-gray, medium-bedded, laminated to nonlaminated lime mudstone; beds are laterally discontinuous. Northward across the shelf 10 km at the type section (Cutoff Mountain), the middle three units lose their distinctiveness, and the upper limestone (unit 5) grades into medium-gray lime mudstone with a few thin wackestone layers. Modern anoxic models (Byers, 1977) have not been previously applied to the Cutoff strata. The distribution pattern of rock types, laminations, and fauna (primarily brachiopods) indicate the Delaware Basin was an anoxic basin with a deep sill (about 400 m depth) during deposition of the Cutoff strata. The basin environment was anaerobic (oxygen absent), and the shelf margin was dysaerobic (low oxygen) throughout Cutoff deposition. The shelf environment was initially dysaerobic but later aerobic (abundant oxygen), possibly by sediment accumulation raising the depositional surface. Based on the interpretations of the anoxic models, an initial shelf depth of 65–85 m is inferred for Cutoff deposition. The lower and upper contacts of the Cutoff Formation are interpreted as submarine unconformities (Pray, 1971) which extend from shelf to basin. The surface between lower and upper Cutoff strata is another, possibly widespread submarine unconformity. The truncation along the upper unconformity causes the discontinuous distribution of the Cutoff strata along the shelf margin. The maximum truncation of underlying strata (300 m) occurs along the shelf margin at the lower unconformity. This removal occurred by submarine erosion, apparently at a time of shelf subsidence. Steep, spoon-shaped "half-channels" (Pray, Crawford, Harris, and Kirkby, 1980) are enigmatic features along the unconformities which truncate at least 100 m of strata at the shelf margin. These surfaces are generally oriented nearly parallel to the shelf edge. Within the Cutoff are numerous, less persistent erosion surfaces. These are smaller, basinward-oriented channels ranging from broad (200-m-wide), flat-sided surfaces to narrow (10-m-wide), steep-sided features. Channel fills are generally intraclastic rudstone, megabreccias, and lutites, but skeletal rudstone and sandstone also occur. The clast lithologies suggest as their source both underlying units (Victorio Peak Formation and Bone Spring Limestone) and lithified Cutoff strata. The upper part of the shelf margin is believed to have been an area of episodic erosion throughout Cutoff time and may have been the source area. The relationships of channel fillings and erosion surfaces indicate that Harms' (1974) model of basin sedimentation by density-driven interflows can be applied to deposition of the Cutoff strata. The age of the upper Cutoff Formation is Guadalupian, based on fusulinids. The lower Cutoff Formation may be Leonardian in age, based on the lack of Guadalupian fusulinids and the unconformity separating it from the upper Cutoff strata. □

MINING REGISTRATIONS

(JULY 8, 1982 THROUGH AUG. 6, 1982)

State Mine Inspector — 2340 Menaul N.E. — Albuquerque, NM 87107

Date and operation	Operators and owners	Location
7–8–82 mill	Operator—Carrizozo mill, Cimarron Mining Corp., Inc., 1651 University NE, Suite 106, Albuquerque, NM 87102; phone: 242-7703; Supt: Robert L. Watson, P.O. Box 486, Carrizozo, NM 88301; phone: 648-2119; Gen. Mgr: Garth Elison, same address and phone; Other officials: Ted W. Elison, President; DeLoy J. Weste, Albuquerque; Property owner—Cimarron Mining Corp., Inc.	Lincoln Co.; sec. 2, T. 8 S., R. 10 E.; private land; north side of US-380, ¼ mi east of the intersection of US-380 and US-54; ore milled—iron ore-magnetite; capacity—150 tons per day average
7–8–82 uranium	Operator—Smith Lake, Teton Exploration Drig. Co., P.O. Drawer A-1, Casper, Wyoming; Gen. Mgr.: Tom Melrose, same address, phone: 307-265-4102; Person in charge: Joe Prendergast (DUR 2000), Ambrosia Lake Office, Grants, NM, phone: 287-4221; Gen. Supt.: Kerry Roe, office address & phone; Property owner—Western Nuclear, P.O. Box 899, Thoreau, NM	McKinley Co.; sec. 17, T. 15 N., R. 12 W.; Grants mineral belt; private land; underground vent shaft; north on NM-57 from Thoreau, NM, to Smith Lake (10 mi)
8–5–82 coal	Operator—Upper York exploration mine, Kaiser Steel Corporation, P.O. Box 1107, Raton, NM 87740; Gen. Mgr.: E. D. Moore, same address, phone: 445-5531; Person in charge: E. D. Moore; Gen. Supt.: H. H. Elkin, same address and phone; Other official: Joe Taylor, Vice President-Coal Group, P.O. Box 58, Oakland, CA 94604; Property owner—Kaiser Steel Corp., P.O. Box 58, Oakland, CA 94604	Colfax Co.; secs. 29 and 30, T. 31 N., R. 18 E.; private land; approximately 38 mi west of Raton on NM-555
8–6–82 coal	Operator—Arroyo No. 1 mine, Arroyo Mining Co., Inc., Star Rt., Box 16-B, Bernalillo, NM 87004; Gen. Mgr.: Jack Lawrence, same address, phone: 867-3594; Gen. Supt.: Dave Williams; Other official: A. J. Firchau, 15965 N.E. 85th, Suite 207, Redmond, WA 98052; Property owner—State of New Mexico	Sandoval Co.; sec. 16, T. 17 N., R. 2 W.; State land; strip; 42 mi post, NM-44, turn left to San Luis, go through town, turn right after passing last cattle guard

(TO BE CONTINUED NEXT ISSUE)